

WHAT IS CLAIMED IS:

1. A wafer carrier assembly for use in a chemical mechanical polishing system, comprising:

a wafer carrier support frame;

a wafer carrier head housing rotatably mounted on said wafer carrier support frame;

a wafer carrier base;

a retaining ring, operatively connected to a retaining ring bearing which allows relative axial motion while constraining relative radial motion between said retaining ring and said wafer carrier head housing;

a retaining ring bellows operatively connecting said retaining ring bearing to urge said retaining ring against a polishing member; and

a bladder bellows operably connecting said wafer carrier base to said wafer carrier head housing such that rotational torque is transferred from said wafer carrier head housing to said wafer carrier base,

and wherein the chamber formed by said bladder bellows, said wafer carrier base, and said wafer carrier head housing may be pressurized to load said wafer carrier base against the polishing member, independent of any frictional loads on said retaining ring.

2. The wafer carrier assembly of claim 1 wherein said retaining ring bearing is a flexure member.

3. The wafer carrier assembly of claim 1 wherein said retaining ring bearing is a hydrostatic bearing.

4. The wafer carrier assembly of claim 1 wherein said retaining ring bellows is pressurized to a pressure in the range of about 0 to 40 psia.

5. The wafer carrier assembly of claim 1 further comprising:
a compartmentalized flexible member connected to the base and defining a

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plurality of chambers, a lower surface of the flexible member providing a wafer receiving surface with a plurality of inner portions associated with respective ones of said plurality of chambers such that pressures within each of said chambers are independently controllable.

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6. The wafer carrier assembly of claim 1, further comprising:
a mounting flange connected to said wafer carrier support frame, said mounting flange having a substantially vertical through-bore;
a cylindrical head shaft rotatably connected to said mounting flange and
10 concentrically disposed in said through-bore; and
an electric motor having a stator mounted on said mounting flange and a rotor mounted on said cylindrical head shaft.

7. The wafer carrier assembly of claim 5 wherein the flexible member
15 includes first, second, third and fourth flanges, each flange being secured to a lower surface of the base to define first, second, third, and fourth chambers, respectively.

8. The wafer carrier assembly of claim 7 wherein said first chamber is
20 circular and has a radial width of about 30 mm, said second chamber is annular and has a radial width of about 30 mm, said third chamber is annular and has a radial width of about 25 mm, and said fourth chamber is annular and has a radial width of about 15 mm.

9. The wafer carrier of claim 1 wherein said bladder bellows is pressurized
25 to a pressure in the range of about 0 to 40 psia.

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10. A wafer carrier assembly for use in a chemical mechanical polishing
system, comprising:

a wafer carrier support frame;
a wafer carrier head housing rotatably mounted on said wafer carrier support
30 frame;
a wafer carrier base;
a retaining ring, operatively connected to a retaining ring bearing which allows

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relative axial motion while constraining relative radial motion between said retaining ring and said wafer carrier head housing;

a retaining ring bellows operatively connecting said retaining ring bearing to urge said retaining ring against a polishing member;

5 a bladder bellows operably connecting said wafer carrier base to said wafer carrier head housing such that rotational torque is transferred from said wafer carrier head housing to said wafer carrier base,

wherein the chamber formed by said bladder bellows, said wafer carrier base, and said wafer carrier head housing may be pressurized to load said wafer carrier base against the polishing member, independent of any frictional loads on said retaining ring; and

10 a compartmentalized flexible member connected to the base and defining a plurality of chambers, a lower surface of the flexible member providing a wafer receiving surface with a plurality of inner portions associated with respective ones of said plurality of chambers such that pressures within each of said chambers are independently

15 controllable.

11. The wafer carrier assembly of claim 10, further comprising:

a mounting flange connected to said wafer carrier support frame, said mounting flange having a substantially vertical through-bore;

20 a cylindrical head shaft rotatably connected to said mounting flange and concentrically disposed in said through-bore; and

an electric motor having a stator mounted on said mounting flange and a rotor mounted on said cylindrical head shaft.

25 12. The wafer carrier assembly of claim 11 further comprising:

a tubular conduit extending concentrically within said head shaft, said tubular conduit including a plurality of passageways for coupling fluid lines to independently pressurize said bellows and said plurality of chambers.

30 13. The wafer carrier assembly of claim 10 wherein said retaining ring bearing is a flexure member.

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14. The wafer carrier assembly of claim 10 wherein said retaining ring bearing is a hydrostatic bearing.

5 15. The wafer carrier assembly of claim 10 wherein said retaining ring bellows and said bladder bellows are each independently pressurized to a pressure in the range of about 0 to 40 psia.

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